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Cutting machining tool

The invention relates to a tool for cutting machining, in particular one in the form of a drill rod having a holder which on one of its ends has a fastening shank and on the other end has a seat for a replaceable cutting element, with a supporting component which is at least partly engaged in the seat in the fastened state, and with a machining component, it being possible to fasten the supporting component by clamping in the seat by means of a fastening component.

DE 41 02 529 A1 discloses a tool holder for rotating cutting tools, especially ones having a rod extending in the direction of the axis of rotation and introducible into a tool seat of a chuck, and having a cutting element mounted eccentrically on one end of the rod, a tool seat of eccentricity adjustable relative to the axis of rotation being mounted for adjustment of the operating radius of the cutting tool. For this purpose there is mounted in an external bushing of the tool holder disclosed a circular opening eccentric from the axis of this bushing and in this opening an interior bushing having an adjustable-rotation seat eccentric relative to the central axis of the opening for the cutting tool. The extent of the eccentricity between the seat for

the cutting tool and the central axis of the opening in the exterior bushing in which the interior bushing is seated is more or less as great as the extent of the eccentricity between the central axis of the opening referred to and the exterior bushing. With the tool holder as disclosed it is possible only to exchange a cutting element mounted on a rod for it by way of the holder in the form of a chuck while the cutting element itself is mounted conventionally, eccentrically, on the free frontal surface of the rod which may be introduced into the chuck. Because of the large number of components this tool holder as disclosed is complex in structure and accordingly expensive; consequently, high-precision machining with the holder in question also is not possible.

A generic tool is disclosed by DE 100 52 016 A1. The tool disclosed is used in particular for rotary milling and has as holder a shaft defining the axis of rotation. This holder may be coupled to a rotary drive and has on its free end a headpiece to which a cutting element may be detachably connected in a mounting configuration in which the cutting edge of the cutting element is positioned at a radial distance from the axis of rotation corresponding to a desired cutting circle diameter. A supporting component on the headpiece performing the function of half-element of the cutting element is mounted so as to be rotatable around an adjustment axis which extends in parallel with the axis of rotation of the shaft and is offset eccentrically from this axis, it being possible to mount the cutting edge of the cutting element as a machining component offset a certain radial distance from the axis of adjustment. In addition, in the case of the solution disclosed a stop mechanism is present by means of which the cutting element component may be locked with the headpiece in selected rotary positions which correspond to the diameter of the cutting circle desired of the cutting edge of the cutting element.

In the case of the tool disclosed the seat has convergent support surfaces of a support area which may be brought into contact with correspondingly convergent contact surfaces of the supporting component. A clamp connection is used to fasten the supporting component in the seat of the holder, there being provided as fastening component a hexagon socket screw which

extends through the exterior circumferential wall of the seat in the holder; hence, the machining component presses against the support surfaces of the support area of the seat. Although this configuration permits very good adjustment of the cutting element in the holder, it is desirable as a prerequisite for high-precision machining with the cutting element that the fastening in question be even further improved in order that high-precision machining may be achieved.

On the basis of the generic tool the object of the invention is, for the purpose of high-precision machining, to effect targeted absorption of vibrations which are induced by machining in the cutting element by the holder of the tool and thus to offset them and at the same time to provide a cost-effective and reliably operating fastening capability for the cutting element. The object as thus formulated is attained with a tool for machining by cutting having the characteristics specified in patent claim 1 in its entirety.

In that, as is specified in the characterizing part of patent claim 1, the seat has an adjustment area in addition to the support area and in that the two areas may be moved toward or away from each other for the purpose of carrying out a process of fastening or replacing the cutting element by means of the fastening component, the disclosed hexagon socket screw with point-by-point introduction of force for the process of fastening the cutting element in the seat of the holder is replaced by two-dimensional support by the movable adjustment area of the seat. Hence, the cutting element may be fastened more reliably over a larger fastening area by means of a supporting component in the seat and on the whole reliable fastening and support are achieved on the basis of three surface areas on the external circumference of the supporting component. In machining with the machining component it would be possible to effect targeted dissipation of vibrations which occur into the holder by way of broad surface areas, so that tolerances are largely eliminated on the basis of the improved support and contact situation.

The tool claimed for the invention may be used as a rotating machine tool such as a milling tool or a drill rod. It is also possible, however, to configure a rotating tool in which the

tool itself remains stationary and the workpiece then rotates along a machining axis opposite the stationary tool. Relative movements of tool and workpiece for a special machining process are also possible.

In one especially preferred embodiment of the tool claimed for the invention the seat is slotted in the direction of the fastening shank for the purpose of forming the support and adjustment area, elastic movement of the two areas relative to each other being made possible by way of the slot in question, which on one of its sides communicates with the exterior. The tool accordingly is designed for long-term use so that the holder remains on the machine tool and the machining component of the cutting element, which component is subject to wear, may be immediately replaced together with this element by a new cutting element. The cutting element preferably is configured as a conventional hard metal cutting tool, for example, one such as that disclosed in DE 100 52 016 A1.

In another preferred embodiment of the tool claimed for the invention the support area has support surfaces convergent toward each other which may be brought into contact with contact surfaces on the supporting component configured to be correspondingly convergent and provision is additionally made such that the adjustment area with its adjustment surface extends transversely to the support surfaces of the support area and accordingly acts on another contact surface on the supporting component. The respective configuration ensures areal contact so that force is introduced into the holder by way of wide areas and the adjustment surface forces the supporting component of the cutting element as a wedge in the direction of the convergent support surfaces inside the seat of the holder. Canting or oblique introduction of the clamping forces such as occur with the disclosed solutions involving hexagon socket screws are reliably prevented by the respective configuration.

In another, especially preferred, embodiment of the tool claimed for the invention the fastening component is in the form of a fastening sleeve with internal threading which may be

screwed onto external threading of the holder with which the respective slots of the seat communicate. By preference provision is also made such that the fastening sleeve, when screwed onto the external threading, forms a clamping surface narrowing as it converges toward the machining component of the cutting element, this clamping surface interacting with a corresponding narrowing circumferential surface of the seat engaged in the slots in the seat. The fastening sleeve in question makes it possible for the movement of adjustment of the adjustment area to the support area to be effected with application of little force by way of this fastening sleeve, it also being possible to carry out the respective fastening process manually by screwing the fastening sleeve onto the holder by way of the corresponding threading. The clamping may then be released by way of unscrewing of the fastening sleeve and removal of the cutting element by hand from the holder by way of the supporting component. In the process the fastening sleeve may remain on the holder. Preferably, however, the possibility also exists of fastening or releasing the fastening sleeve, in the manner described, by way of force application points on the external circumference of this sleeve by means of a conventional handling tool such as a wrench.

In one especially preferred embodiment of the tool claimed for the invention, at least the interior surface of the adjustment area facing the supporting component of the cutting element has in its longitudinal direction a convex clamping surface designed to be crowned. Consequently, any canting of the tool in the longitudinal direction inside the seat may be eliminated by way of the convex clamping surface, it accordingly also being possible to increase the clamping force to be applied.

In another preferred embodiment of the tool claimed for the invention, the fastening sleeve rests in its central area on the external threading of the seat by way of its internal threading, and at its free end both on the front external circumference of the seat and on the frontal area of the holder the rear area of which ends in a fastening shank. The fastening sleeve is accordingly additionally supported at its front and its rear ends and the forces introduced into the cutting edge of the cutting element during machining may accordingly be dissipated by way

Claims

1. A tool for cutting machining, in particular in the form of a drill rod, having a holder (10) which on one of its ends has a fastening shank and on the other a seat (12) for a replaceable cutting element (16) having a supporting component (18) which is engaged at least partly in the seat (12) when in the fastened state, and having a machining component (20), it being possible to fasten the supporting component (18) in the seat (12) by clamping by means of a fastening component (22) and the seat (12) having a support area (28), characterized in that the seat (12) has an adjustment area (30) in addition to the support element (28), and in that the two areas (28, 30) may be moved away from or toward each other by means of the fastening component (22) for the purpose of carrying out a process of fastening or replacing the cutting element (16).

2. The tool as claimed in claim 1, wherein, for the purpose of forming the support (28) and the adjustment (30) area the seat (12) is slotted in the direction of the fastening shank and wherein elastic relative movement of the two areas (28, 30) to each other is made possible by way of the respective slot (32), one free end of which communicates with the exterior.

3. The tool as claimed in claim 1 or 2, wherein the support area (28) has support surfaces (34) convergent toward each other, which support surfaces (34) may be brought into contact with contact surfaces (36) designed to be correspondingly convergent on the supporting component (18) and wherein the adjustment area (30) with its adjustment

surface (38) extends transversely to the support surfaces (34) of the support area (28) and accordingly acts on another contact surface (40) on the supporting component (18).

4. The tool as claimed in claim 2 or 3, wherein the fastening component (22) has a fastening sleeve (42) with internal threading (44) which fastening sleeve (42) may be screwed onto the external threading (46) of the holder (10) with which the respective slots (32) of the seat (12) communicate.

5. The tool as claimed in claim 4, wherein the fastening sleeve (42) after having been screwed on forms a clamping surface (48) which narrows as it converges toward the machining component (20) of the cutting element (16), such clamping surface (48) interacting, when the cutting element (16) is clamped in the holder (10), with a correspondingly narrowing circumferential surface (50) of the seat (12) through which the slots (32) of the seat (12) extend.

6. The tool as claimed in claim 5, wherein the interior surface (52) faces in its longitudinal direction at least the interior surface (52) of the adjustment area (30) which faces the supporting component (18) of the cutting element (16) designed to be crowned to form a convex clamping surface.

7. The tool as claimed in one of claims 4 to 6, wherein the central area of the fastening sleeve (42) rests on the external threading (46) of the seat (12) by way of its internal threading (44) and at its free ends both on the front external circumference (54) of the seat (12) and on the front area (56) of the holder (10).

8. The tool as claimed in one of claims 3 to 7, wherein the adjustment surface (38) of the adjustment area (30) is curved so as to be concave and wherein the other contact surface (40) of the supporting component (18) of the cutting element (16) is more greatly curved

convexly than the adjustment surface (38) which may be brought into contact is curved concavely.

9. The tool as claimed in one of claims 3 to 8, wherein the convergent support surfaces (34) of the support area (28) are interconnected by their ends opposite each other by way of a connecting area (62) the wall thickness of which is smaller than the wall thicknesses selected for the support area (28) in the area of its support surfaces (34).

10. The tool as claimed in one of claims 1 to 9, wherein the seat (12), as seen in cross-section, is made up to the extent more or less of two-thirds of the supporting component (28) and to the extent of one-third by the adjustment area (30).